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ORIGINAL ARTICLE

Effect of HealthCorps, a High School Peer Mentoring Program, on Youth Diet and Physical Activity

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Abstract

Background: The purpose of this study was to evaluate the effect of HealthCorps, a high school peer mentoring program, on youth diet, physical activity, health knowledge, BMI, and percent body fat.

Methods: This study had a quasi-experimental nonrandomized design with 6 intervention schools and 5 control schools. The estimation sample consisted of 971 high school students (511 intervention, 460 control). The intervention lasted for one semester and consisted of specially trained recent college graduates serving as peer mentors to teach nutrition and promote physical activity. Outcome measures included self-reported diet and physical activity, health knowledge, and measured BMI and percent body fat. Difference-in-differences models were estimated, controlling for student characteristics including age, gender, grade, and ethnicity.

Results: HealthCorps was associated with a reduction in self-reported consumption of soda pop of 0.61 times per week ($p = 0.04$), or 13.0%. This beneficial effect was concentrated among girls, among whom the HealthCorps program lowers soda pop consumption by 1.12 times per week ($p < 0.01$), or 25.7%. The above estimates were based conservatively on the assumption of zero benefit for dropouts; excluding dropouts from the analysis resulted in larger effect sizes, including the result that students who participated in HealthCorps were 45% more likely to report that they were more physically active now than they were last year ($p = 0.05$).

Conclusions: HealthCorps is effective in reducing soda pop consumption, in particular among girls. In general, peer mentoring holds promise for improving youth diet and physical activity behaviors.

Introduction

Since 1970, the prevalence of obesity has more than tripled among adolescents aged 12–19 years.[1] During 2007–2008, 18.1% of US youths aged 12–19 years were obese, which is more than triple the *Healthy People 2010* goal of 5%.[2,3] This has led the US government, the Institute of Medicine (IOM), and researchers to declare obesity an epidemic among American youths with important implications for physical health, mental health, medical care costs, and adult obesity.[4–10]

Public health and medical organizations, as well as researchers, have encouraged immediate action to prevent or reduce obesity among youths and have advocated targeting interventions to minority, low-income youths who are at the greatest risk of obesity.[3–5,11,12] However, such efforts are severely limited by the lack of information about what works to prevent or reduce childhood obesity.[13,14] Moreover, many interventions have had disappointing results.[15,16] One review has concluded that there is insufficient evidence regarding the benefits of school-based obesity prevention programs because of a lack of published evaluations.[17]

Recognizing the need for information on what works to prevent childhood obesity, the IOM has encouraged the evaluation of additional school-based antiobesity interventions, which it described as an essential priority action for the near future.[5] In response to that call, this paper reports findings from an evaluation of HealthCorps, a school-based obesity prevention program that targets low-income, minority urban youths. HealthCorps was first implemented in New York City in 2004 and as of 2011 it had expanded to 41 schools in 11 states with roughly 24,600 youths currently enrolled. HealthCorps is slated

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to be implemented in 50 schools in 12 states in the year 2012. In this study, we analyze data from 971 students in 11 high schools to measure the impact of HealthCorps on self-reported diet and physical activity, health knowledge, and measured BMI and percent body fat.

Methods

Subjects

Participants were 1159 students (593 treatment, 566 control). A total of 971 students (511 treatment, 460 control) had valid data for both the baseline and follow-up for at least one outcome. These participants were drawn from 11 high schools (6 treatment, 5 control). Participating high schools were chosen in cooperation with the New York City (NYC) Department of Education for their geographic proximity and similarity of their student bodies. All of the high schools are in New York City. Of the treatment schools, 4 are in Manhattan, 1 is in Queens, and 1 is in the Bronx. Of the control schools, 1 is in Manhattan, 1 is in Queens, 2 are in the Bronx, and 1 is in Brooklyn. All had student bodies that were at least 49% Hispanic and less than 11% white, with at least 58% of the total student body eligible for free lunch. Within the treatment schools, principals picked at random the health classes that would participate in HealthCorps. The majority of participants were freshmen, with the remainder equally divided between sophomores, juniors, and seniors. Summary statistics for the participants in the treatment and control groups, and analysis of attrition, are provided in the Results section, below.

The HealthCorps Intervention

The HealthCorps intervention educates students about physical fitness and nutritional balance with the ultimate goal of leading them to healthier lifestyles. It is targeted to minority, low-income, inner-city students that are at the highest risk of developing obesity.[5,12]

The curriculum for HealthCorps was developed by Dr. Mehmet Oz, Professor of Surgery at Columbia University, in consultation with an advisory board of medical experts. Major sections of the curriculum included: How Your Body Thinks (which teaches students about the biology of metabolism and fat), How You Are What You Eat (which teaches students to be educated consumers of food), and How to Make the Move (which concerns physical fitness and developing lifelong habits of an active lifestyle). The curriculum is designed to be consistent with IOM recommendations for innovative approaches to expand opportunities for physical activity and enhance health curricula in schools.[5] The 2007 curriculum for HealthCorps is detailed in Appendix A and is available for download on the journal website as supplementary online material.

A particularly innovative aspect of the design of HealthCorps is the delivery of its curriculum through peer mentors—recent college graduates selected to match the demographics of the student participants. In this way, the design of HealthCorps is consistent with the theory of communal coping, which is the process in which interpersonal relationships are used to confront challenges.[18] Specifically, it involves a cooperative problem-solving process (in the case of HealthCorps, cooperative between the peer mentor, individual students, and the group of students) to identify issues relevant to the group and to identify potential solutions to the problem. The relevance of communal coping for obesity prevention is that it allows specific groups (in this case, adolescent members of ethnic minority groups who live in urban areas) to identify their own challenges and potential solutions to the problems of healthy eating and active living.[19] Moreover, the use of peer mentors in particular—*i.e.*, those who are relatively close in terms of age, race and ethnicity, and other characteristics–holds promise for capitalizing on social networks and interpersonal relationships to enhance the effectiveness of health promotion interventions.[19]

In this study, one coordinator (peer mentor) was assigned to each of the six treatment schools. These coordinators were recent college graduates (pre-med majors) with excellent academic records and volunteer experience. All 6 were female, and 2 were Caucasian, 2 were African American, and 2 were Hispanic; they were matched to schools on the basis of the ethnicity and race of the student body. Prior to teaching in schools, all coordinators received 2 weeks of intensive training in nutrition, physical fitness, and mental resilience education by experts in the respective fields. All coordinators also received 2 weeks of professional development.

Peer mentors delivered the HealthCorps curriculum in the form of classroom workshops (in regularly scheduled health education classes), weekly lunch seminars, drop-in office hours, and after-school clubs for discussion and group physical activity. HealthCorps' use of peer mentoring is consistent with a call by researchers at the NIH for obesity prevention programs to exploit communal coping and convey obesity prevention messages through interpersonal relationships to increase their effectiveness and increase the likelihood of behavior change.[19]

All participation was voluntary; students could participate in some components but not others. The multifaceted approach was used because different components were favorable to different students. Most commonly, there were 20 HealthCorps classes offered during the semester, with variation due to (*e.g.*) the frequency of the health education classes into which HealthCorps was incorporated and holidays. Despite the voluntary nature of participation, attendance was high. Mean attendance at HealthCorps classroom workshops was 87.8%, with median attendance of 93.8%.

Instruments and Procedure

A quasi-experimental nonrandomized design was used. The intervention took place in 6 high schools. Five high

schools that were scheduled to receive the intervention the following year served as controls. Schools in the treatment and control groups are similar in the following ways: All were located in New York City, in each school a majority of students was eligible for free lunch, and in each school the student body was at least 49% Hispanic. Within the treatment schools, principals picked at random the health classes that would participate in HealthCorps. Data were collected at baseline and at the end of the 14-week semester (which was either fall 2007 or spring 2008).

This evaluation focused on the weight-related targets of the HealthCorps intervention. The short-term objectives of HealthCorps include improved diet and nutrition, increased physical activity, and increased health knowledge. The long-term objectives include promotion of healthy weight. These behavioral targets were measured using questionnaires, knowledge assessment surveys, and objective measures of weight and fatness, each of which is described below.

Students completed identical surveys at baseline and at the end of the intervention semester; survey questions on dietary frequencies and physical activity were taken from the Youth Risk Behavior Surveillance System (YRBS). The four measures of food frequency were: The number of times in the past week that the student ate fruit, green salad, soda pop, and fast food. In addition, the survey asked about two diet-related health behaviors: Whether the student reads nutrition labels and whether the student reads ingredient lists when buying foods. There were seven measures of self-reported physical activity. Three concerned the number of days per week that the student engaged in particular kinds of activity: Vigorous exercise, light exercise, and strength-building exercise. These are the outcomes chosen by the CDC to monitor progress toward the *Healthy People 2010* physical activity goals for youths.[3] Students were also asked whether they were relatively active compared to students their own age, and whether they were more active this year than last year. The final two measures concerned inactivity: The number of hours of television watched on the average school day, and the number of hours spent playing video games or other computer games on the average school day. Students also completed a Knowledge Assessment Survey (KAS), which is a 35-item survey of knowledge relating to diet, physical activity, and obesity developed by the HealthCorps team. (A copy of the KAS is Appendix B and is available for download on the journal website as supplementary online material). The following demographic information was also collected: Gender, race and ethnicity, age, and grade.

A bioelectrical impedance analysis device (Tanita model BF-522) was used to measure percent body fat and weight in kilograms.[20] Height was measured using a tape measure affixed to the wall. BMI was calculated as weight in kilograms divided by height in meters squared. Obesity and overweight were defined using the current consensus definitions for youth: Obese was defined as a BMI equal to or greater than the historic 95th percentile for gender and age, and overweight or obese was defined as a BMI equal to or greater than the historic 85th percentile for gender and age.[21]

Youth participation was voluntary. Prior to the commencement of the study, signed parental consent forms were received for all subjects, and data collection methods were approved by the Beam and NYC Department of Education Institutional Review Boards.

Data Analysis

HealthCorps was evaluated using the difference-in-differences model, which was estimated for each of the following outcomes: Each of the six measures of diet, each of the seven measures of physical activity, and each of the four anthropometric measures (BMI, percent body fat, overweight, obese).[22] The difference-in-differences model measures the change in the outcome over the time of the intervention, in the treatment group relative to the control group. In other words, it measures the improvement in the outcome that is due to the treatment. Regressors in the model included indicator variables for gender, race and ethnicity [African American, other (which includes Asians, whites, and multiracial), and Hispanic], age, grade, and semester (fall 2007 or spring 2008). Models also controlled for the number of days between the baseline and follow-up data. To account for possible correlation in outcomes for all students in the same school (*e.g.*, because of common school environment), standard errors were cluster-corrected at the school level. All regressions were estimated using the statistical software package STATA SE version 10.1 (College Station, TX). The sample size for any given regression varies due to individual item nonresponse.

Attrition is a common problem in evaluations of weight loss interventions, and there are several strategies for handling it.[23,24] This paper presents findings for both completers analysis and baseline-carried-forward analysis. The completers analysis examines data only for those who completed the study; it is likely to be biased toward showing an impact of the treatment, as those most likely to quit are probably those for whom the intervention was least effective.[23] The baseline-carried-forward analysis assumes that all dropouts gained zero benefit from the intervention; it may cause downward bias in the estimate of efficacy, because some dropouts may have benefited from the program.

Results

Summary Statistics at Baseline

Variable means for the treatment and control groups at baseline are presented in Table 1, along with the *p* values associated with the hypothesis that the mean values for the two groups are equal. In both the treatment and control groups, females constituted roughly 51% of the

Table 1. Variable Means at Baseline by Group[a]

Variable	Treatment	Control	*p* value
Outcomes			
Times/week eat fruit	3.99	4.35	0.12
Times/week eat green salad	2.37	2.58	0.24
Times/week drink soda pop	4.68	4.53	0.60
Times/week eat fast food	2.07	2.00	0.65
Read nutrition information (percent)	43.53	43.78	0.93
Read ingredient list (percent)	39.22	42.99	0.20
Days/week of vigorous exercise	3.70	3.35	0.01
Days/week of light exercise	2.87	2.95	0.58
Days/week of strength-building exercise	2.74	2.41	0.02
Relatively more active than peers (percent)	85.01	83.04	0.41
More active than last year (percent)	77.61	74.29	0.21
Hours/day of television	2.63	2.62	0.85
Hours/day of video and computer games	1.97	2.05	0.42
Score on Knowledge Assessment Survey	11.45	11.51	0.83
Percent body fat	23.24	22.76	0.43
BMI	24.14	23.40	0.02
Obese (percent)	22.53	17.63	0.04
Overweight (percent)	38.55	36.72	0.54
Control variables			
Female (percent)	50.88	51.11	0.94
Hispanic (percent)	80.41	62.83	<0.01
African American (percent)	11.58	18.94	<0.01
Other (white, asian, multiethnic; percent)	8.01	18.23	<0.01
Age	15.31	15.08	<.001
Grade	10.05	9.71	<0.01

[a]This table lists the mean of each variable, separately for treatment and control groups, and the p value associated with the hypothesis that the means for the two groups are equal.

sample and the average age was roughly 15. Hispanics and African Americans combined constituted 92% of the treatment group and 82% of the control group. At baseline, outcome measures were similar in the treatment and control groups. There were no significant differences in any of the four food frequency measures, or in reading nutrition labels or reading ingredient information. The treatment group had slightly higher frequencies of vigorous exercise (3.70 versus 3.35 days per week, $p = 0.01$) and strength-building exercise (2.74 vs. 2.41 days per week, $p = 0.02$). The average baseline score on the health knowledge assessment survey was not significantly different for the treatment and control groups. In both the treatment and control groups, average percent body fat was roughly 23% and average BMI was roughly 23–24. The baseline prevalence of obesity in the treatment group, 22.53%, was significantly greater than that in the control group, 17.63% ($p = 0.04$).

Attrition

Because surveys and measurements typically took place on different days, attrition differed for the two types of outcomes. Attrition for the survey portion was 13.7% for the treatment group and 18.2% for the control group. Attrition for the measurements portion was 21.8% for the treatment group and 19.8% for the control group. Reasons for attrition, by group, are listed in Table 2. Some reasons in particular suggest that students were not missing at random; for example, in most cases, the largest number of dropouts were those who were either absent two or more times from data collection or were "always absent" according to the HealthCorps coordinator. For other explanations, such as transferring classes, it is impossible to know whether the transfer was necessitated by other courses or was done because the student was not making progress in the HealthCorps program. We assume that the relative few who left school, moved, or were suspended were "missing at random" and could be ignored. In the baseline-carried-forward analysis, it was conservatively assumed that all of those who were absent, transferred classes, or refused to participate in the follow-up data collection experienced zero change in outcomes.

Table 2. Reasons for Attrition, by Group

	Treatment group		Control group	
Reason	Survey attrition	Measurement attrition	Survey attrition	Measurement attrition
Absent 2+ times from data collection and/or "always absent" according to coordinator	35	39	56	55
Absent 1 time from data collection, unable to revisit	13	50	32	41
Transferred classes	23	23	6	6
Left school/moved	7	6	7	7
Refused	2	10	2	3
Suspended	1	1	0	0
Total	81	129	103	112

Effects of HealthCorps

Table 3 lists the estimated effect of HealthCorps on each outcome. The difference-in-differences model measures the change in the outcome over the time of the intervention, in the treatment group relative to the control group. In other words, it measures the improvement in the outcome that is due to HealthCorps. The first column of Table 3 lists estimates from a completers analysis in which all those who dropped out were assumed to be missing at random and therefore ignorable, and the second lists estimates from a baseline-carried-forward model that adjusts for attrition by assuming that all dropouts stayed at or returned to their baseline value for each outcome. For the sake of clarity and brevity, only the estimates of program effects are reported, but full results of each regression model are available upon request.

Completers Analysis

Column 1 of Table 3 indicates that HealthCorps participants reduced their soda pop consumption by 0.85 times per week relative to the control group ($p = 0.04$). Given that the average number of times per week that youths in the treatment group consumed soda pop was 4.68 at baseline, this represents a 17.5% decrease. HealthCorps participants were also 45% more likely than those in the control group to report that they are more physically active now than they were last year ($p = 0.05$).

Although the point estimates indicate that HealthCorps participants acquired more health knowledge than the control group, as measured by an increase of 1.51 correct answers (or 13.2% improvement) on the Knowledge Assessment Survey, this increase was not statistically significant at the 5% level ($p = 0.09$). There was no statistically significant impact of HealthCorps on the other measures of diet, reading nutrition labels or ingredient lists, physical activity, or the four anthropometric measures.

Baseline-Carried-Forward Analysis

Models were re-estimated in a baseline-carried-forward analysis, in which dropouts were included in the regression, with their postintervention outcomes set equal to their baseline values. In other words, it was assumed that

Table 3. Effect of HealthCorps on Self-Reported Diet, Physical Activity, Measured BMI, and Body Fat

Outcome	(1) Completers only	(2) Adjusting for attrition	Outcome	(1) Completers only	(2) Adjusting for attrition
Times/week eat fruit	–0.41 p = 0.23 N = 911	–0.36 p = 0.19 N = 1075	Days/week of strength-building exercise	–0.07 p = 0.65 N = 909	–0.11 p = 0.39 N = 1073
Times/week eat green salad	0.19 p = 0.23 N = 917	0.20 p = 0.12 N = 1081	Relatively more physically active than peers (relative risk)	1.12 p = 0.75 N = 681	1.23 p = 0.49 N = 815
Times/week drink soda pop	–0.85** p = 0.04 N = 785	–0.61** p = 0.04 N = 949	More physically active than last year (relative risk)	1.45** p = 0.05 N = 811	1.36* p = 0.09 N = 962
Girls only	–1.56*** p < 0.01 N = 390	–1.12*** p < 0.01 N = 483	Hours/day of TV	–0.01 p = 0.90 N = 902	–0.03 p = 0.68 N = 1066
Boys only	–0.13 p = 0.73 N = 395	–0.08 p = 0.76 N = 466	Hours/day of video and computer games	0.18 p = 0.31 N = 897	0.14 p = 0.31 N = 1061
Times/week eat fast food	–0.13 p = 0.42 N = 931	–0.09 p = 0.44 N = 1095	Score on Knowledge Assessment Survey	1.51* p = .09 N = 929	1.22* p = .08 N = 1091
Read nutrition information (relative risk)	.92 p = .57 N = 911	1.06 p = .74 N = 1072	Percent body fat	0.32 p = 0.27 N = 826	0.22 p = 0.37 N = 1025
Read ingredient list (relative risk)	0.89 p = 0.45 N = 910	1.06 p = 0.68 N = 1071	BMI	–0.09 p = 0.57 N = 862	–0.08 p = 0.46 N = 1061
Days/week of vigorous exercise	–0.38 p = 0.24 N = 933	–0.32 p = 0.21 N = 1097	Obese (relative risk)	0.72 p = 0.48 N = 862	0.66 p = 0.40 N = 1057
Days/week of light exercise	0.27 p = 0.23 N = 926	0.18 p = 0.27 N = 1090	Overweight or obese (relative risk)	1.47 p = 0.42 N = 862	1.44 p = 0.75 N = 1057

* = significant at 10%; ** = significant at 5%; *** = significant at 1%.

dropouts experienced zero benefit from the program. Results of the baseline-carried-forward analysis are presented in column 2 of Table 3. Even after the adjustment for attrition, HealthCorps significantly decreases soda pop consumption by 0.61 times per week ($p = 0.04$), which is a 13.0% decrease from baseline.

However, assuming zero benefit to every dropout naturally decreases the magnitude of the estimated effects. Although HealthCorps participants were 36% more likely to report that they were more active than last year, this increase was not significant at a 5% level ($p = 0.09$). Also, although HealthCorps participants' scores on the Health Knowledge Assessment rose by 1.22 correct answers (which is a 10.7% increase from baseline), the improvement was not significant at a 5% level ($p = 0.08$).

Differences by Gender

We tested whether the effects of HealthCorps differ for girls and boys. The null hypothesis of an equal effect for girls and boys was rejected for only one outcome—consumption of soda pop. When models for that outcome were estimated separately by gender, it became apparent that the beneficial effect of HealthCorps on soda pop consumption was concentrated among girls. Specifically, HealthCorps decreased the soda pop consumption of girls by 1.56 times per week ($p < 0.01$) in a completers analysis (column 1 of Table 3) and by 1.12 times per week ($p < 0.01$) in a baseline-carried-forward analysis (column 2 of Table 3). These results represent substantial reductions of 35.7% and 25.7%, respectively, from girls' soda pop consumption at baseline. In contrast, the effect of HealthCorps on boys' soda pop consumption was small and not significantly different from zero.

Discussion

The IOM has urged researchers to determine what works and does not work to prevent childhood obesity and to share that information broadly.[5] This report contributes to the evidence base by estimating the effects of one important and widely implemented school-based obesity prevention program, HealthCorps.

The strongest and most robust effect of HealthCorps is that it lowers consumption of soda pop by 0.61 times per week ($p = 0.04$), or 13.0%. This beneficial effect is concentrated among girls, among whom HealthCorps lowers soda pop consumption by 1.12 times per week ($p < 0.01$), or 25.7%.

These estimates are conservative in that they are based on the assumption that all dropouts received zero benefit from the program. When models are estimated using only those who completed the program, estimated effect sizes are considerably higher: HealthCorps reduces soda pop consumption among girls by 1.56 times per week ($p < 0.01$), or 35.7%. Moreover, in models estimated using only those who completed the program, HealthCorps raised the probability of students reporting that they are more physically active now than they were last year by 45% ($p = 0.05$).

The finding that HealthCorps decreases girls' consumption of soda pop is of considerable interest because soda pop consumption is associated with youth obesity in both observational studies and randomized controlled experiments.[25,26] These findings are of particular significance because they were achieved among students generally considered to be at high risk for obesity—inner-city Hispanic and African-American students of low socioeconomic status.[5,12]

There was no detectable effect of HealthCorps on weight or body fat. In part, this may be due to the duration of the intervention; it may not be realistic to expect changes in weight or body composition in a period as brief as one semester. In addition, it is common for school-based interventions to have no detectable effect on weight despite improvements in some measures of diet or exercise.[15,16] Some researchers encourage a focus on changing diet and obesity without expecting short-term changes in weight; for example, Katz (p. 262) writes: "[E]xpecting too much of any isolated intervention is an invitation to find success masquerading as failure. Thus we need to evaluate programs realistically for the potential contributions they may make as parts of a strategic whole…Most interventions are apt to influence upstream or midstream variables; only an aggregation of effective programming is likely to produce meaningful change in the downstream variables."[27]

There are two noteworthy limitations of this study. First, the HealthCorps intervention was not assigned randomly to schools. Randomization of schools would have been preferable, but the fact that they were not randomized should not lead one to ignore the evidence found in this evaluation. A recent review, in its grading system for the quality of evaluations of school-based obesity prevention programs, emphasizes that observational and quasi-experimental design offer reasonable alternatives when randomization is not feasible and in fact allows for methodologically strong quasi-experimental or observational studies to earn the highest evidence grade.[17] Likewise, the IOM emphasizes that "All types of evaluation can make an important contribution to the evidence base upon which to design policies, programs, and interventions [to prevent childhood obesity]."[5]

The second limitation is the short-term nature of the intervention (one semester) and that there is not follow-up data beyond the end of the intervention. The intervention was likely too brief to have a detectable impact on weight or body fat. Use of self-reported as opposed to objectively measured dietary intake and physical activity is another limitation; in particular, there is a risk of social desirability bias.[28]

Future directions for research include collecting and analyzing longer follow-up data to determine the persistence of the decrease in soda pop consumption and increase in physical activity. In previous research, some school-based interventions have found that improvements dissipate over summer break; longer follow-up

data would permit estimation of the longer-run impacts of HealthCorps.[29] Another important direction for future research is to determine which aspects of the HealthCorps intervention are responsible for the documented effects; once these program elements have been identified, the curriculum can be modified to increase its effectiveness.

Conclusion

Public health and medical organizations have encouraged immediate action to prevent obesity among youths, especially minority, low-income youths who are at the greatest risk of obesity.[3–5,11,12] HealthCorps was designed to fill that need by educating minority, low-income, inner-city high school students about physical fitness and nutritional balance through the innovative medium of peer mentoring.

This study found that HealthCorps significantly reduces soda pop consumption, in particular among girls, which is important given the association between soda pop consumption and youth obesity.[25,26] There are also promising benefits for physical activity and health knowledge, although they fall short of statistical significance.

Previous research has found that the use of young people as peer educators in a school setting is associated with improvements in adolescents' knowledge regarding human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS).[30] The findings of this study indicate that peer educators also hold promise for improving high school students' diets and physical activity.

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Appendices A and B are available online as Supplementary Material: www.liebertonline.com/chi

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